

NATIONAL CLINICAL CHEMISTRY REFERENCE LABORATORY

Department of Laboratory Services

NATIONAL CLINICAL CHEMISTRY REFERENCE LABORATORY SERVICES

The laboratory provides a wide range of biochemical tests, analysing electrolytes, enzymes, hormones and proteins in the blood, urine and cerebrospinal fluid. State-of-the-art instrumentation and stringent quality control measures enable quality-assured results reported in a timely manner.

General and Immuno-Chemistry unit offers tests on general chemistry such as electrolytes, cardiac enzymes, liver function, lipids and glucose monitoring. Automated immunoassay analyzers enable accurate testing of hormones and tumour markers.

Special Chemistry unit concentrates on glycated haemoglobin (HbA1c) measurement, neonatal screening, pheochromocytoma screening, renal calculi analysis, specialized protein testing and therapeutic drugs monitoring.

Address

RIPAS Hospital, 1st floor National Clinical Chemistry Reference Laboratory Department of Laboratory Services,
Bandar Seri Begawan, Brunei



Contact

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Telephone: 2242424

Head of Section	EXT 6321
Routine & Immuno-chemistry (Core Chemistry)	EXT 6321
Special Chemistry Section	EXT 6042

Laboratory Personnel

Head of Section: Zurina Hj Md Hashim

Deputy Head of Section: Md Hazman bin Hj Abu Hassan

Staff:

- Scientific Officers
- Senior Laboratory Technologist
- Senior Laboratory Technician
- Laboratory Technician
- Laboratory Assistant

Operating Hours

We operate 24 hours daily for common chemistry tests.

Low volume tests and more specialised tests are performed during office hours.

We also aim to provide STAT results within 2 hours upon specimens receipt in the laboratory. An ongoing improvement is in place to reduce turn-around time further. Do not label STAT excessively so that STAT test orders can be attended immediately. STAT test results are critical for immediate patient management.

TEST ORDERS THAT REQUIRED PRIOR NOTIFICATION

Please inform laboratory prior to sending the specimen for the following tests:

- Ammonia
- Lactate

These samples must NOT be delivered through pneumatic tube in case there is an unforeseen technical issue.

ADD-ON REQUEST

Add-on request is not encouraged due to sample evaporation (e.g. Osmolality & Bicarbonate) and sample degradation (e.g. Ammonia, Lactate and Glucose.)

We reserve the right to reject the add-on request if:

- No add-on form received after verbal request
- Sample volume is insufficient
- Request is not within the same day
- Stability of sample is in doubt

REFERENCE RANGES FOR PAEDIATRIC AND PREGNANT WOMEN

Please contact the laboratory for further information on these reference ranges.

TESTS NOT AVAILABLE LOCALLY

Please contact the laboratory at 2242424 **ext. 6321** for sample requirement and special instruction for collection if required.

The tests sent abroad will be processed as soon as possible. Results are generally available within one month and can be collected from the Laboratory during office hours.

TEST CATALOGUE

1. NATIONAL CLINICAL CHEMISTRY REFERENCE LABORATORY, RIPAS HOSPITAL

Please contact the laboratory for further information on reference ranges for paediatric and pregnant women referenceranges

Alanine Transaminase (ALT, GPT)

Specimen	Blood (SSTII gold top-5ml)
Unacceptable	Haemolysed
Method	Enzymatic
TAT	1 day
Clinical Usage	Liver profile assessment
Reference Range	Adult (Male): <45 U/L Adult (Female): <34

Albumin

Specimen	Blood (SSTII gold top - 5ml)
Method	Colometric (Bromcresol Green)
TAT	1 day
Clinical Usage	Indicator of nutritional status
Reference Range	Adult: 35 – 50g/L 60 – 90Y: 32-46 g/L >90Y: 29 -45 g/L

Albumin, 24hr Urine

Specimen	24 hr urine collection; no preservative
Method	Colorimetry
TAT	1 day
Clinical Usage	Indicator of renal impairment
Reference Range	Normal < 30.0 mg/day Microalbuminuria 30.0 –299.9 mg/day Proteinuria > 300.0 mg/day

Albumin:Creatinine Ratio (ACR)

Specimen	Random urine, 20ml in sterile screw-capped container
Method	Calculated from urine albumin and urine creatinine, colorimetry
TAT	1 day
Clinical Usage	Early detection of diabetic nephropathy
Reference Range	Normal < 3.0 mg/mmol Microalbuminuria 3.0 - 30.0 mg/mmol Albuminuria > 30.0 mg/mmol

Alkaline Phosphatase (ALP)

Specimen	Blood (SSTII gold top- 5ml)
Unacceptable	Haemolysed
Method	Para-nitrophenyl Phosphate
TAT	1 day
Clinical Usage	Liver profile assessment
Reference Range	Adult (Male) 16-21Y - 56-167 U/L 22-79 Y – 50-116 U/L Adult (Female) 16-29 Y – 44-107 U/L 30-79 Y - 46 – 122 U/L

Alpha-1-Antitrypsin (AAT)

Specimen	Blood (SSTII gold top - 5mL)
Method	Turbidimetric/Immunoturbidimetric
TAT	1 week
Clinical Usage	Test for Alpha-1-antitrypsin deficiency
Reference Range	0.9 – 2.0g/L

Alpha-feto Protein (AFP)

Specimen	Blood (SSTII gold top - 5mL)
Method	2-step immunoassay c3using CMIA technology
TAT	1 week
Clinical Usage	A tumour marker for hepatocellular carcinoma and testicular cancer
Reference Range	0.89 - 8.78 mg/mL

Amikacin Level, Peak

Specimen	Blood (SSTII gold top – 5ml or red top) Collect 30 min after end of IV infusion, 60 min after IM injection
Unacceptable	Haemolysed, more than 24 hours old
Method	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)
TAT	1 day, STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	Peak : 25 - 35 mg/L Panic high : >35mg/L(Random and peak)

Amikacin Level, Trough

Specimen	Blood (SSTII gold top – 5ml or red top) Collect before the next dose
Unacceptable	Haemolysed, more than 24 hours old
Method	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)
TAT	1 day, STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	4.0 – 8.0mg/L Panic high : >8mg/L(trough)

Ammonia (NH₃)

Specimen	Blood (green top only- 4mL)
Transport	Please call Lab prior to collection. Specimen in ice. Send to the Lab immediately.
Unacceptable	Specimen not chilled
Method	Glutamate Dehydrogenase
TAT	1 day, STAT
Clinical Usage	Screening test for amino acid disorders
Reference Range	Adult 18 – 72 µmol/L

Amylase, serum

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	Enzymatic (CNP3 substrate)
TAT	1 day
Clinical Usage	Diagnosis of pancreatitis
Reference Range	28 – 100 U/L

Amylase, Urine

Specimen	Random urine, 20mL in sterile screw-capped container or 24 hr urine collection; no preservative
Method	CNP3 substrate
TAT	1 day
Clinical Usage	Diagnosis of pancreatitis
Reference Range	Random: NA 24 Hours: 24 - 408 U/day

Aspartate Aminotransferase (AST, SGOT)

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	Enzymatic (NADH (without P-5'-P))
TAT	1 day
Clinical Usage	Liver and cardiac assessments
Reference Range	Adult: 11 – 34 U/L

Bence Jones Protein, Urine (Screening)

Specimen	Random urine, 20mL in sterile screw-capped container, no preservative, preferred early morning urine specimen
Transport	Send to the Lab immediately
Method	Bradshaw's test
TAT	1 day
Clinical Usage	Screening test for multiple myeloma and amyloidosis
Reference Range	Not detected in normal individuals

Beta-2-Microglobulin

Specimen	Blood (SSTII gold top - 5mL)
Method	Turbidimetric/immunoturbidimetric
Performed	Monday
TAT	1 week
Clinical Usage	Monitoring of lymphoma and multiple myeloma
Reference Range	0.97-2.64 mg/L

Bicarbonate, Serum (HCO₃)

Specimen	Blood (SSTII gold top - 5mL),
Transport	Send to the Lab immediately, and not suitable for add on test
Method	Enzymatic (pep Carboxylase)
TAT	Routine- 1 day, STAT – 2hrs
Clinical Usage	Acid-base balance
Reference Range	22 – 29 mmol/L

Bicarbonate, Urine

Specimen	Random urine, 20mL in a screw-capped container
Transport	Send to the Lab immediately
Method	Enzymatic
TAT	1 Day
Clinical Usage	Acid-base balance
Reference Range	NA

Bilirubin, Direct

Specimen	Blood (SSTII gold top - 5ml or green top- 4ml)
Transport	Protect sample from light and send to the Lab
Unacceptable	Haemolysed
Method	Diazo Reaction
TAT	1 day
Clinical Usage	Differential diagnosis of jaundice
Reference Range	Adults - 0 .0 - 8.6 $\mu\text{mol/L}$

Bilirubin, Total

Specimen	Blood (SSTII gold top - 5ml or green top- 4ml)
Transport	Protect sample from light and send to the Lab
Unacceptable	Haemolysed, overnight
Method	Diazonium Salt
TAT	1 day
Clinical Usage	Diagnosis of jaundice
Reference Range	Adult: 5.1 – 20.5 $\mu\text{mol/L}$

Blood Gases, Arterial

Specimen	Blood in heparinised syringe or capillary tube (Sample syringe can be obtained from the Laboratory)		
Transport	Ensure blood is mixed well and remove air bubbles if present in the sample. Needle must be removed and use the cap provided to recap the syringe tightly. Send the sample immediately. Do not send through pneumatic tube.		
Unacceptable	Clotted, air bubbles in blood		
Method	Potentiometry, Optical PO ₂		
TAT	1 day		
Clinical Usage	Evaluate acid-base status		
Reference Range	pH	7.350 - 7.450	
	pCO ₂		
	Male:	35.0	48.0 mmHg
	Female:	32.0	45.0 mmHg
	pO ₂	83.0 - 108.0 mmHg (Male and Female)	
	Bicarbonate-Act	22.0 - 28.0 mmHg	
	Bicarbonate-Std		
	Male:	22.0	28.0 mmol/L
	Female:	21.8	26.9 mmol/L
	Base(ecf)		
	Male:	-3.2	1.8
	Female:	-2.3	2.7
	O ₂ Saturation	95.0 - 99.0 % (Male and Female)	

CA 125

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
TAT	1 week
Clinical Usage	Monitoring therapy in ovarian cancer
Reference Range	≤ 35.0 U/mL

CA 15-3

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
TAT	1 week
Clinical Usage	Monitoring therapy in breast cancer
Reference Range	≤ 31.3 U/mL

CA 19-9

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
TAT	1 week
Clinical Usage	Monitoring therapy in pancreatic and hepatobiliary cancer
Reference Range	≤ 37.0 SRFU/mL

Ceruloplasmin

Specimen	Blood (SSTII gold top - 5mL)
Method	Immunoturbidimetric
Performed	Monday
TAT	1 week
Clinical Usage	Assessment of disorder of copper metabolism
Reference Range	0.2 – 0.6g/L

Calcium, Ionised

Specimen	Blood (SSTII gold top - 5ml or green top - 6ml) Additional tube is required for this test if it is requested with other tests.
Unacceptable	Haemolysed
Method	Potentiometry
TAT	1 day, STAT-2 hours
Clinical Usage	Evaluation of calcium metabolism
Reference Range	1.16 – 1.32 mmol/L

Calcium, Urine	
Specimen	Random urine, 20mL in sterile screw-capped container Or 24 hr urine collection; preservative 6M HCL
Method	Arsenazo III Dye
TAT	1 day
Clinical Usage	Evaluation of calcium metabolism
Reference Range	Random: Not Available 24 hours: 2.50 – 7.50 mmol/day, varies with diet

Calcium:Creatinine Ratio	
Specimen	24 hr urine collection, preservative : 6MHCL
TAT	1 day
Clinical Usage	Evaluation of calcium metabolism
Reference Range	NA

Calcium, Total	
Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed
Method	Arsenazo III Dye
TAT	1 Day
Clinical Usage	Evaluation of calcium metabolism
Reference Range	Adult Male (20-39 years old) - 2.28 – 2.60mmol/L Adult Female (20 -39 years old) – 2.25-2.53 mmol/L Male and Female (40 – 79 years old) – 2.25 – 2.55 mmol/L Male (80 – 120 years old) – 2.12 – 2.46 mmol/L Female (80 – 120 years old) – 2.13 – 2.54 mmol/Lphosphate

Calculi Analysis	
Specimen	Calculi send it in a screw-capped container (please Indicate source, rinse with distilled water, air dry sample prior sending the specimen to the laboratory)
Method	Biochemical tests
TAT	2 weeks
Clinical Usage	Management of patient with recurrent renal calculi
Reference Range	Report indicates presence/absence of components

Carbamazepine	
Specimen	Blood (SSTII gold top – 5ml)
Method	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)
TAT	1 day, STAT
Clinical Usage	Monitoring of Carbamazepine dosage
Reference Range	Therapeutic: 17- 51 µmol/L

Carboxyhaemoglobin, Blood (CoHb)

Specimen	Heparinised blood gas syringe. Mix well to prevent clotting. Only anaerobic samples must be submitted
Transport	Send in ice to the laboratory immediately
Unacceptable	Specimen that has been left at room temperature for more than 30 minutes, been opened or spun.
Method	Co-oximetry
Performed	Daily
TAT	2hrs STAT
Clinical Usage	Assessment of carbon monoxide poisoning
Reference Range	Toxic level >15% May increase with heavy smokers

Carcinoembryonic Antigen (CEA)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
TAT	1 week
Clinical Usage	Monitoring therapy in colon cancer ; Increased levels seen in smokers
Reference Range	Non-smoker: < 5.0 ng/mL Smoker: up to 6.5 ng/mL

Chloride (Cl)

Specimen	Blood (SSTII gold top - 5ml)
Method	Indirect ISE
TAT	1 day
Clinical Usage	Ion-selective electrode diluted (indirect)
Reference Range	98 – 107 mmol/L

Chloride, Urine

Specimen	Random urine, 20mL in sterile screw-capped container or No preservative
Method	Indirect ISE
TAT	1 day
Clinical Usage	Electrolyte balance
Reference Range	Random: NA 24 hours: 110 – 250 mmol/day (Varies with chloride intake)

Cholesterol

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Fasting less than ,10 – 12 hrs
Method	Enzymatic
TAT	1 day
Clinical Usage	Evaluation of lipid status
Reference Range	Desirable: < 5.18 mmol/L

Cholinesterase

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Enzymatic
TAT	1 – 2 weeks
Clinical Usage	Indicator of organophosphate poisoning
Reference Range	Adult: Male: 4389 – 10928 U/L Female: 2879 – 12669 U/L

Complement C3

Specimen	Blood (SSTII gold top - 5ml)
Method	Immunoturbidimetric
Performed	Every Monday
TAT	1 week
Clinical Usage	Assessment of classical and alternate complement pathway
Reference Range	Male 1–14 yrs: 0.80 – 1.70 g/L 14–80 yrs: 0.82 – 1.85 g/L Female 1–14 yrs: 0.82 – 1.73 g/L 14–80 yrs: 0.83 – 1.93 g/L

Complement C4

Specimen	Blood (SSTII gold top - 5ml)
Method	Immunoturbidimetric
Performed	Monday
TAT	1 week
Clinical Usage	Assessment of classical and alternate complement pathway
Reference Range	Male 1–14 yrs: 0.14 – 0.44 g/L 14–80 yrs: 0.15 – 0.53 g/L Female 1–14 yrs: 0.13 – 0.46 g/L 14–80 yrs: 0.15 – 0.57 g/L

Cortisol, Serum (Morning and Mid- night specimen)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Delayed 1-step Immunoassay using CMIA technology
TAT	1 day
Clinical Usage	Screening test for Cushing's Syndrome
Reference Range	Adults : Before 10 am : 102.1 - 535.2 nmol/L After 5 pm : 80.0 - 477.3 nmol/L

C-peptide

Specimen	Blood (SSTII tube or red top- 5ml), fasting specimen (8-10 hrs) required
Unacceptable	Non Fasting
Method	Chemiluminescent Microparticle Immunoassay (CMIA)
TAT	1 week
Clinical Usage	Indicator of pancreatic secretory function. Helpful in differential diagnosis of hypoglycaemia
Reference Range	< 5.19 ng/mL

C-Reactive Protein (CRP), high sensitive

Specimen	Blood (SSTII gold top - 5ml)
Method	Turbidimetric / Immunoturbidimetric
TAT	1 day
Clinical Usage	Detect inflammation and tissue injury
Reference Range	< 0.5 mg/dL

Creatine Kinase – MB Mass (CKMB)

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, lipemic ,overnight
Method	2-step immunoassay using CMIA technology
TAT	Routine - 1 day, STAT – 2 hours
Clinical Usage	Test for myocardialinfarction
Reference Range	Adults Males: 0.3-4.87 ng/ml Females : 0.3–3.61 ng/ml

Creatine Kinase (CK)

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	NAC(N-acetyl-L-cysteine)
TAT	1 day
Clinical Usage	Assessment of skeletal & cardiac muscle disorders
Reference Range	Adults Male: 30 – 200 U/L Female: 29 – 168 U/L

Creatinine

Specimen	Blood (red top - 6mL or SSTII gold top)
Method	Kinetic Alkaline Picrate
TAT	Routine - 1 day, STAT – 2 hours
Clinical Usage	Renal function test
Reference Range	Adult Male: 63.6 – 110.5 µmol/L Female: 50.4 – 98.1 µmol/L

Creatinine Clearance Test (CCT), (24Hr)

Specimen	1. 24 hours urine collection, no preservative 2. Serum creatinine (blood in SSTII gold top - 5mL) taken during the collection period. Send both specimens together
Unacceptable	Only one specimen type received
Method	Calculated
Performed	Office hours only
TAT	1 day
Clinical Usage	Estimation of Glomerular Filtration Rate (GFR)
Reference Range	Male : 66 – 163 ml/min Female : 66 – 165 ml/min Concentration is based on urine output of 1.5 L

Creatinine, Urine

Specimen	Random urine, 20mL in sterile screw-capped container or 24 hours urine collection, no preservative
Unacceptable	Collection instruction not followed
Method	Kinetic Alkaline Picrate (Jaffe Reaction)
Performed	Daily
TAT	1 day
Clinical Usage	Renal function test
Reference Range	Random: Male : 5.6 - 14.7 mmol/ Female : 4.2 - 9.7 mmol/L 24 hour : Male : 8.4 - 22.0 mmol/day Female : 6.3 - 14.6 mmol/day

CSF Chemistry (Glucose and Total Protein)

Specimen	1mL of CSF, in sterile screw-capped container
Transport	Send to the Lab immediately
Unacceptable	Contaminated with blood
Method	Potentiometry, Colorimetry
TAT	1 day
Clinical Usage	Assessment of CNS diseases and infection
Reference Range	CSF Glucose 2.22 – 3.89 mmol/L CSF Protein 0.15 – 0.40 g/L CSF Lactate 1.1 – 2.4 mmol/L Appearance Clear

**Cyclosporine 0,
Trough (CYA 0)**

Specimen	Blood (purple top 2-4mL) 2 hours after dose
Method	2-step immunoassay using CMIA technology
Performed	Monday
TAT	1 week, urgent 1 day
Clinical Usage	Therapeutic drug monitoring
Reference Range	For Kidney Transplant <6 months: 400 - 800 ng/mL >6 months: 200 - 400 ng/mL

Cyclosporine Peak (CYA)	A,
Specimen	Blood (purple top 2-4mL) 2 hours after dose
Method	2-step immunoassay using CMIA technology
Performed	Monday
TAT	1 week, urgent 1 day
Clinical Usage	Therapeutic drug monitoring
Reference Range	For Kidney Transplant <6 months: 400 - 800 ng/mL >6 months: 200 - 400 ng/mL

Dehydroepiandrosterone-Sulphate (DHEA-S)	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Delayed one-step immunoassay using CMIA technology
Performed	Monday
TAT	1 week
Clinical Usage	Evaluation of androgenstatus
Reference Range	Male : 11-14 Y - 0.5 – 6.6 µmol/L 15-19 Y - 1.2 – 10.4 µmol/L 20-24 Y - 6.5 – 14.6µmol/L 25-34 Y - 4.6 – 16.1 µmol/L 35-44 Y - 3.8 – 13.1 µmol/L 45-54 Y - 3.7 – 12.1µmol/L 55-64 Y - 1.3 – 9.8 µmol/L 65-70 Y - 6.2 – 7.7 µmol/L Female : 11-14 Y - 0.2 – 4.6 µmol/L 15-19 Y - 1.7 – 13.4 µmol/L 20-24 Y - 3.6 – 11.1µmol/L 25-34 Y - 2.6 – 13.9 µmol/L 35-44 Y - 2.0 – 11.1 µmol/L 45-54 Y - 1.5 – 7.7 µmol/L 55-64 Y - 0.8 – 4.9 µmol/L 65-70 Y - 0.9 – 2.1 µmol/L

Digoxin	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Draw blood at least 6 hours after the last dose
Method	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)
TAT	1 day,STAT
Clinical Usage	Monitoring of Digoxin dosage
Reference Range	1.02 – 2.56 nmol/L

Estradiol (E2)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Delayed 1-step Immunoassay using CMIA technology
TAT	1 week
Clinical Usage	Evaluation of hypothalamic -pituitary-ovarian axis. Investigation of infertility. Males : Investigate unexplained gynecomastia
Reference Range	Male : 11 - 44 pg/mL Female : Follicular: 21 - 251 pg/mL Mid-Cycle : 38 - 649 pg/mL Luteal : 21 - 312 pg/mL Post Menopause not on HRT: <10-28 pg/mL Post Menopause on HRT: 10 – 144 pg/mL

Ferritin

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
TAT	1 day
Clinical Usage	Screening test for iron status
Reference Range	Adults : Males 21.81 - 274.66 ug/L Females F 4.63 - 204.00 ug/L

Folate

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Transport	Send to the Lab immediately
Method	2-step immunoassay using CMIA technology
TAT	1 week
Clinical Usage	Investigation for megaloblastic anaemia and assessment of folate deficiency
Reference Range	Adults 7.0 - 46.4 nmol/L

Follicular Stimulating Hormone (FSH)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
TAT	1 week
Clinical Usage	Evaluation of hypothalamic -pituitary-ovarian axis. Investigation of infertility.
Reference Range	Male : 0.95 - 11.95 mIU/mL Female : Follicular : 3.03 - 8.08 mIU/mL Mid-Cycle : 2.55 - 16.69 mIU/mL Luteal : 1.38 - 5.47 mIU/mL Post-Menopausal: 26.72 - 133.41 mIU/mL

Gamma-Glutamyl Transferase (GGT)

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed
Method	L-Gamma-glutamyl-3-carboxy-4-nitroanilide Substrate
Performed	Daily
TAT	1 day
Clinical Usage	Liver profile assessment
Reference Range	Adults: Male : 0 – 55 U/L Female : 0 – 38 U/L

Gentamicin Level, Peak

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Collect 30 min after end of IV infusion, or 1 hour after IM injection
Unacceptable	Haemolysed, more than 24 hours old
Method	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)
TAT	1 day,STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	5.0 – 10.0µg/L

Gentamicin Level, Trough

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Collect specimen immediately before next dose
Unacceptable	Haemolysed, more than 24 hours old
Method	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)
TAT	1 day,STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	0- 2.0 µg/L

Glucose Tolerance Test (GTT)

Specimen	Blood (grey top - 3mL). Submit 2 specimens: Fasting and 2 hours after glucose (75g) intake			
Unacceptable	Time taken not labelled on tubes			
Method	Enzymatic (Hexokinase / G-6-PDH)			
TAT	1 day			
Clinical Usage	Diagnosis of diabetes mellitus			
Reference Range	Fasting	Normal 3.5–6.0 mmol/L	Impaired 6.1–6.9 mmol/L	Diabetic ≥7.0 mmol/L
	2 hrs after glucose intake	4.0–7.8 mmol/L	7.8–11.0 mmol/L	≥11.1 mmol/L

Glucose

Specimen	Blood (grey top - 3mL) preferred or (SSTII gold top - 5mL)		
Unacceptable	Time taken less than 2 hours or fasting less than 8 hours		
Method	Enzymatic (Hexokinase / G-6-PDH)		
TAT	Routine 1 day, STAT 2 hrs.		
Clinical Usage	Diagnosis and monitoring of diabetes mellitus		
Reference Range	Fasting	3.5 – 6.0 mmol/L	
	Random	4.0 – 7.8 mmol/L	
	Post-prandial	4.0 – 7.8 mmol/L	
	Post breakfast	4.0 – 7.8 mmol/L	
	Post lunch/dinner	4.0 – 7.8 mmol/L	
	GTT:		
	Fasting:	3.5 – 6.0 mmol/L	
	2 Hours	4.0 – 7.8 mmol/L	

Glucose-6-Phosphate Dehydrogenase

Specimen	Neonatal cord blood or whole blood (green top, 4mL or purple top, 4mL)
Method	Fluorescence Spot Test
Performed	Daily
TAT	1 week
Clinical Usage	Screening test for G6PD deficiency. Note: any recent blood transfusion or acute haemolysis can affect the results obtained with this test.

Glycated Haemoglobin A1c (HbA1c)

Specimen	Whole Blood (purple top, 2-4mL)
Unacceptable	Clotted
Method	HPLC
Performed	Daily
TAT	5 days
Clinical Usage	Long term monitoring of glucose control in diabetes mellitus
Reference Range	The expected HbA1C range for non-diabetic adults is 4-6% ≥6.5 – - Diabetic 6.0 – 6.4 - Pre-Diabetic <6.0 - Non- Diabetic

Haptoglobin

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Immunoturbidimetric
TAT	1 week
Reference Range	Adult: Male >12 – 60Y: 0.14–2.58g/L Female >12 – 60Y: 0.35–2.50g/L Male >60Y: 0.40-2.68 g/L Female >60Y: 0.63-2.73 g/L

HDL Cholesterol

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Fasting less than 10 – 12 hrs
Method	Accelerator Selective Detergent
Performed	Daily
TAT	1 dayPH
Clinical Usage	Evaluation of lipid status
Reference Range	Low: <1.04 mmol/L Desirable : > 1.55 mmol/L

Human Chorionic Gonadotropin (hCG), Beta Total

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
Performed	Daily
TAT	1 day, Ward (2hr)
Clinical Usage	Tumour Marker for hydatiform mole, choriocarcinoma, ectopic pregnancy and testicular cancer
Reference Range	Non-pregnant: <5mIU/mL Early Pregnancy : 5 – 25 5mIU/mL

Immunofixation Electrophoresis, Urine

Specimen	Random urine (20mL in sterile screw-capped container), preferred 24 hour urine collection; no preservative, or early morning urine specimen
Method	Capillary electrophoresis
TAT	1 week
Clinical Usage	Identification of different types of myeloma
Reference Range	See Lab report

Immunoglobulin A

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Immunoturbidimetric
TAT	1 week
Clinical Usage	Evaluation of humoral immunity
Reference Range	Age specific see report Male : 0-3 months : 0.01 - 0.34 g/L >3 months - 1 Y : 0.08 - 0.91 g/L >1 - 12 Y : 0.21 - 2.91 g/L >12-60 Y : 0.63 - 4.84 g/L >60 Y : 1.01 - 6.45 g/L Female : 0-3 months : 0.01 - 0.34 g/L >3 months - 1 Y : 0.08 - 0.91 g/L >1 - 12 Y : 0.21 - 2.82 g/L >12-60 Y : 0.65 - 4.21 g/L >60 Y : 0.69 - 5.17 g/L

Immunoglobulin G

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Immunoturbidimetric
TAT	1 week
Clinical Usage	Evaluation of humoral immunity
Reference Range	Age specific see report

Male :

0-1 month : 3.97 - 17.65 g/L
>1 month - 1 Y : 2.05 - 9.48 g/L
>1 - 2 Y : 4.75 - 12.10 g/L
>2-80 Y : 5.40 - 18.22 g/L

Female :

0-1 month old : 3.91 - 17.37 g/L
>1 month - 1 Y : 2.03 - 9.34 g/L
>1 - 2 Y : 4.83 - 12.26 g/L
>2-80 Y : 5.52 - 16.31 g/

Immunoglobulin M

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Immunoturbidimetric
Performed	Monday
TAT	1 week
Clinical Usage	Evaluation of humoral immunity
Reference Range	Age specific see report

Male :

Newborn : 0.06 - 0.21 g/L
3 months - 1 Y : 0.17 - 1.43 g/L
>1 - 12 Y : 0.41 - 1.83 g/L
>12 Y : 0.22 - 2.40 g/L

Female :

Newborn : 0.06 - 0.21 g/L
3 months - 1 Y : 0.17 - 1.50 g/L
>1 - 12 Y : 0.47 - 2.40 g/L
>12 Y : 0.33 - 2.93 g/L

Insulin, Fasting

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml), fasting specimen (8 hours) is required
Unacceptable	Non-fasting
Method	1-step immunoassay using CMIA technology
TAT	1 week
Clinical Usage	Indicator of pancreatic beta-cells function
Reference Range	Fasting : 2.0 - 25.0 mU/L

Iron (Fe)

Specimen	Blood (SSTII gold top - 5ml)		
Unacceptable	Haemolysed		
Method	Ferene		
Performed	Daily		
TAT	1 day		
Clinical Usage	Evaluation of iron status		
Reference Range	Adults	Male	11.6 - 31.3 $\mu\text{mol/L}$
		Female	9.0 - 30.4 $\mu\text{mol/L}$

Lactate

Specimen	Blood (grey top only, 3mL), draw blood without stasis to avoid spurious lactate elevation. Please call lab prior to collection.		
Transport	Specimen in ice, send to the Lab immediately		
Unacceptable	Specimen not chilled, haemolysed, overnight		
Method	Lactic Acid to Pyruvate		
TAT	1 day		
Clinical Usage	Evaluation of metabolic and lactic acidosis		
Reference Range	Adults : Venous, 0.5 – 2.2 mmol/L		

Lactate Dehydrogenase (LDH)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Unacceptable	Haemolysed, overnight
Method	Colorimetry Lactate to pyruvate (NADH)
TAT	1 day
Clinical Usage	Non-specific marker of cellular damage
Reference Range	125 – 220 U/L

Lactate Dehydrogenase Fluid

Specimen	Abdominal (peritoneal, dialysis, bile): collect 10-15mL aseptically into a sterile tube. Pericardial, synovial & exudates: collect 3-5mL aseptically into a sterile tube.
Unacceptable	Haemolysed, overnight
Method	Colorimetry Lactate to pyruvate (NADH)
TAT	1 day
Clinical Usage	Non-specific marker of cellular damage
Reference Range	NA

LDL Cholesterol (calculated value)	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Unacceptable	Fasting less than 10 – 12 hours
Method	Calculated
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of lipid status
Reference Range	Desirable < 3.36 mmol/L

Lipid Panel	
Specimen	Blood (SSTII gold top - 5ml). Fasting specimen (10-12 hrs) required
Unacceptable	Non-fasting specimen
Method	<i>Panel test: Cholesterol, Triglyceride, HDL, LDL (calculated) See individual test</i>
Performed	Daily
TAT	1 day
Clinical Usage	Lipid profile assessment
Reference Range	Refer to individual analytes

Liver Function Test (LFT)	
Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	<i>Panel test: Total Protein, Albumin, Total Bilirubin, ALT, ALP, GGT see individual test</i>
Performed	Daily
TAT	1 day
Clinical Usage	Liver profile assessment
Reference Range	Refer to individual analytes

Luteal Hormone (LH)	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
Performed	Office hours only
TAT	7 days
Clinical Usage	Evaluation of hypothalamic-pituitary-ovarian axis. Investigation for infertility.
Reference Range	Central 95% of Data Male : 0.57 - 12.07 mIU/mL Female : Follicular Phase: 1.80 - 11.78 mIU/mL Mid-Cycle Peak: 7.59 - 89.08 mIU/mL Luteal Phase: 0.56 - 14.00 mIU/mL Post-Menopausal (No HRT): 5.16 - 61.99 mIU/mL

Magnesium (Mg)	
Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	Enzymatic
TAT	1 day
Clinical Usage	Diagnosis and monitoring of hypo- and hypermagnesemia
Reference Range	Adults 0.66 – 1.07 mmol/L
Magnesium, Urine	
Specimen	• Random urine, 20mL in sterile screw-capped container or • 24 hours urine collection with preservative: 6M HCL, keep refrigerated during collection
Unacceptable	Collection instruction not followed
Method	Enzymatic
Performed	Daily
TAT	1 day
Clinical Usage	Diagnosis and monitoring of hypo- and hypermagnesemia
Reference Range	Random: NA 24 hours: 3.00 - 5.00 mmol/day

Methotrexate	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml), to inform lab prior sending sample
Method	1-step Immunoassay using CMIA technology
TAT	1 day, STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	Post treatment 5.0 – 10.0 µmol/L 24 – 48 hours 0.5 – 1.0 µmol/L 48 – 72 hours < 0.2 µmol/L

Microalbumin, Urine	
Specimen	Random urine, 20mL in sterile screw-capped container, no preservative, preferred first morning urine specimen
Method	Turbidimetric/immunoassay
Performed	Daily
TAT	1 day
Clinical Usage	Early detection of diabetic nephropathy
Reference Range	Normal < 30.0 mg/L Microalbuminuria 30.0 – 300.0 mg/L Proteinuria > 300.0 mg/L

Microalbumin: Creatinine Ratio Urine

Specimen	Random urine, 20mL in sterile screw-capped container, no preservative, preferred first morning urine specimen		
Method	Calculated from urine microalbumin and urine creatinine, colorimetry		
Performed	Daily		
TAT	1 day		
Clinical Usage	Early detection of diabetic nephropathy		
Reference Range	Normal		
	Male:	<2.5 mg/mmol	
	Female:	< 3.5 mg/mmol	
	Microalbuminuria		
	Male:	2.5 – 30 mg/mmol	
	Female:	3.5 – 30 mg/mmol	
	Proteinuria:	> 30.0 mg/mmol	

Myoglobin, Urine (qualitative)

Specimen	Fresh random urine, 20mL in sterile screw-capped container. Test not suitable for add-on
Transport	Send to the laboratory immediately
Method	Ultra-centrifugation
Perform	Daily
TAT	24 hours, STAT- 2 Hours
Clinical Usage	Presence indicates muscle damage

NT-Pro BNP

Specimen	Blood (SST II Tube / Gold top – 5 ml)
Unacceptable	Non-serum sample
Method	2-step immunoassay using CMIA technology
Perform	Daily
TAT	STAT-2 Hours, Routine 1 day
Clinical Usage	Biomarker for excluding acute Congestive Heart Failure (CHF) and for detection of mild forms of cardiac dysfunction
Reference Range	0-74 yrs : 0 – 124pg/mL >75 yrs : 0 – 449 pg/mL NT-ProBNP >125.0 pg/mL for patients <75 yrs old And NT-ProBNP >450.0 pg/mL for patients >75 yrs old - considered as abnormal and suggestive of patients with HF

Osmolality, Serum

Specimen	Blood (SSTII goldtop - 5ml)
Method	Freezing point osmometry
TAT	1 day
Clinical Usage	Assessment of fluid and electrolyte balance
Reference Range	275 – 305mOsm/kg H ₂ O

Osmolality, Urine	
Specimen	Random urine (20mL screw-capped container), no preservative.
Transport	Send to the Laboratory immediately
Method	Freezing point osmometry
TAT	1 day
Clinical Usage	Assessment of fluid and electrolyte balance
Reference Range	50 – 1200mOsm/kg H ₂ O

Paracetamol (Acetaminophen)									
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml), Infrom lab prior sending specimen								
Method	Enzymatic / colorimetric								
TAT	1 day, STAT								
Clinical Usage	Diagnosis of paracetamol toxicity								
Reference Range	<table> <tr> <td>Therapeutic</td><td>10 – 30 ug/L</td></tr> <tr> <td>Toxic levels</td><td> <table> <tr> <td>4 hrs</td><td>> 150 ug/L</td></tr> <tr> <td>24 hrs</td><td>> 4.7 ug/mL</td></tr> </table> </td></tr> </table>	Therapeutic	10 – 30 ug/L	Toxic levels	<table> <tr> <td>4 hrs</td><td>> 150 ug/L</td></tr> <tr> <td>24 hrs</td><td>> 4.7 ug/mL</td></tr> </table>	4 hrs	> 150 ug/L	24 hrs	> 4.7 ug/mL
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4 hrs	> 150 ug/L								
24 hrs	> 4.7 ug/mL								

Paraquat, Urine (Qualitative)	
Specimen	Urine (20mL in a sterile screw-capped container)
Method	Dithionite
TAT	1 day STAT
Clinical Usage	Screening test for paraquat poisoning
Reference Range	Not detected

Parathyroid Hormone, Intact (PTH)	
Specimen	Blood EDTA -5ml
Transport	Send to the Lab immediately
Method	2-step immunoassay using CMIA technology
Reference Range	1.59 – 7.24 pmol/L

Phenobarbital	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)
TAT	1 day
Clinical Usage	Monitoring of Phenobarbitone dosage
Reference Range	Therapeutic: 65 - 172 µmol/L

Phenytoin	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Enzyme immunoassay
TAT	1 day
Clinical Usage	Monitoring of Phenytoin dosage
Reference Range	Therapeutic : 40.0 – 79.0 µmol/L

Phosphate (PO₄)/Phosphorus, Serum	
Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	Phosphomolybdate
TAT	1 day
Clinical Usage	Assessment of calcium and phosphate disorders
Reference Range	Adults ≥18 years old : 0.81 – 1.52 mmol/L

Phosphate, Urine	
Specimen	Random urine, 20mL in sterile screw-capped container, Or 24 hours urine collection, no preservative; 6M HCL
Method	Phosphomolybdate
Performed	Daily
TAT	1 day
Clinical Usage	Assessment of calcium and phosphate disorders
Reference Range	Random urine Adult Male: 1.6 – 6.1 mmol/L Adult Female: 2.3 – 4.8 mmol/L 24hr Urine Phosphate Adult Male and Female: 12.9 – 42.0 mmol/day

Potassium, (K)	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Unacceptable	Haemolysed, overnight
Method	Ion-selective electrode diluted (Indirect)
TAT	Routine 1 day, STAT-2hour
Clinical Usage	Evaluation/assessment of electrolyte imbalance
Reference Range	Adults 3.5 – 5.1 mmol/L

Potassium, Urine	
Specimen	Random urine, 20mL in sterile screw-capped container, or 24 hr urine collection, no preservative
Method	Indirect ISE
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation/assessment of electrolyte imbalance
Reference Range	Random: 25 – 150 mmol/L 24 hours: 25 – 125 mmol/day (varies with diet)

Progesterone	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	1-step Immunoassay using CMIA technology
Performed	Monday and Thursday
TAT	1 week
Clinical Usage	Evaluation of ovarian function. Detect progesterone-secreting tumour
Reference Range	Central 95% interval Males < 0.1 – 0.2 ng/mL Females Follicular < 0.1 – 0.3 ng/mL Luteal Phase 1.2 – 15.9 ng/mL post menopause < 0.1 – 0.2 ng/mL First Trimester 2.8 – 147.3 ng/mL Second Trimester 22.5 – 95.3 ng/mL Third Trimester 27.9 – 242.5 ng/mL

Prolactin	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
Performed	Monday and Thursdays
TAT	1 week
Clinical Usage	Evaluation of subfertility, hypogonadism and pituitary gland function
Reference Range	Children See Laboratory report Adults, Males 3.46– 19.40 ng/ml Females 5.18 – 26.53 ng/ml

Prostate Specific Antigen, Free (fPSA)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
Performed	Monday and Thursday
TAT	1 week
Clinical Usage	Tumour marker for prostate cancer
Reference Range	0 – 0.5ng/mL

Prostate Specific Antigen, Total (PSA)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Draw before rectal examination or biopsy procedure.
Method	2-step immunoassay using CMIA technology
Performed	Monday and Thursday
TAT	1 week
Clinical Usage	Tumour marker for prostate cancer
Reference Range	Adults < 4.0 ng/mL

Protein Electrophoresis, Serum

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Agarose gel / capillary electrophoresis
Performed	Office hours only
TAT	14 days
Clinical Usage	Diagnosis of multiple myeloma, macroglobulinaemia
Reference Range	Total Protein 60 – 83 g/L Albumin 35 – 50 g/L Alpha 1 Globulin 1 – 3 g/L Alpha 2 Globulin 4 – 8 g/L Beta 1 Globulin 6 – 11 g/L Beta 2 Globulin 2.3 – 4.7 g/L Gamma Globulin 10 – 19 g/L

Protein, Total

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	Colorimetry (Biuret)
Performed	Daily
TAT	1 day
Clinical Usage	Marker of nutritional status
Reference Range	Adults : 64 – 83 g/L

Total Protein, CSF	
Specimen	1mL of CSF, in sterile screw-capped container Please call lab prior to collection.
Unacceptable	Haemolysed, overnight
Method	Colorimetry (Biuret)
Performed	Daily
TAT	1 day
Clinical Usage	Marker of nutritional status
Reference Range	Adults : 0.10 – 0.45 g/L

Total Protein Fluid	
Specimen	Abdominal (peritoneal, dialysis, bile): collect 10-15mL aseptically into a sterile tube. Pericardial, synovial & exudates: collect 3-5mL aseptically into a sterile tube.
Unacceptable	Haemolysed, overnight
Method	Colorimetry (Biuret)
Performed	Daily
TAT	1 day
Clinical Usage	Marker of nutritional status
Reference Range	Adults : 0.10 – 0.45 g/L

Protein, 24hr Urine	
Specimen	24 hr urine collection, no preservative.
Unacceptable	Collection instruction not followed
Method	Colorimetry
Performed	Daily
TAT	1 day
Clinical Usage	Indicator of renal impairment
Reference Range	< 0.2 g/day

Protein : Creatinine Ratio, Urine	
Specimen	Early morning urine, 20mL in sterile container or 24 hr urine collection, no preservative
Method	Calculated
TAT	1 day
Clinical Usage	Assessment of renal impairment
Reference Range	Proteinuria > 45 mg/mmol

Reducing Sugar, Stool

Specimen	Stool in sterile screw-capped container
Transport	Send to the lab immediately
Method	Biochemical tests
Performed	Daily
TAT	1 day
Clinical Usage	Test for disorders of carbohydrate metabolism in newborns
Reference Range	Negative

Reducing Sugar, Urine

Specimen	Random urine, 20mL
Transport	Send to the Lab immediately
Method	Biochemical tests
Performed	Daily
TAT	1 day
Clinical Usage	Test for disorders of carbohydrate metabolism in newborns
Reference Range	Negative

Rheumatoid Arthritis (RA) Factors

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Immunoturbidity
Performed	Monday
TAT	1 week
Clinical Usage	Supports diagnosis of Rheumatoid Arthritis and evaluation of ankylosing spondylitis, Sjogren's syndrome, scleroderma, dermatomyositis and SLE
Reference Range	<30 IU/mL

Salicylate

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Enzymatic/Colorimetric
TAT	1 day, STAT
Clinical Usage	Diagnosis of salicylate poisoning
Reference Range	Adult Therapeutic: 150 - 300 mg/L Toxic : > 300 mg /L Lethal: > 700 mg/L

Sex Hormone Binding Globulin (SHBG)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step immunoassay using CMIA technology
Performed	Monday
TAT	1 week
Clinical Usage	Useful in investigation of hirsutism and virilisation in females
Reference Range	Adults, Male 11.2 – 78.1 nmol/L Female 12 – 137 nmol/L

Sodium (Na)

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight or lipaemic
Method	Ion-selective electrode diluted (Indirect)
TAT	Routine 1 day, STAT 2 hrs
Clinical Usage	Evaluation of fluid and electrolyte imbalance
Reference Range	Adults 136 – 145 mmol/L

Sodium, Urine

Specimen	Random urine: 20mL in sterile screw-capped container, or 24 hr urine collection, no preservative
Method	Indirect ISE
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of fluid and electrolyte imbalance
Reference Range	Random: NA 24 hr: Adults 40 – 220 mmol/day

Synacthen Test: Cortisol at 0',30' & 60'

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Clearly label individual tube
Method	Electrochemiluminescence Immunoassay
Performed	Office hours only
TAT	1 day
Clinical Usage	Assessment of adrenal function
Reference Range	See individual report

Tacrolimus

Specimen	Blood (purple top, 2-4mL)
Method	1-step delayed Chemiluminescent Microparticle Immunoassay
Performed	Every Monday
TAT	1 week, Urgent 1 day
Clinical Usage	Therapeutic drug monitoring
Reference Range	Target 12 hr trough whole blood: 5 – 12 ng/mL early post-transplant

Testosterone			
Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)		
Method	Delayed 1-step Immunoassay using CMIA technology		
Performed	Monday and Thursday		
TAT	1 week		
Clinical Usage	Evaluation of subfertility in males; hirsutism and virilisation in females		
Reference Range	Male		
	21 – 49 Y:	8.33 – 30.19 nmol/L	
	≥50 Y:	7.66 – 24.82 nmol/L	
	Female		
	21 – 49 Y:	0.48 – 1.85 nmol/L	
	≥50 Y:	0.43 – 1.24 nmol/L	

Theophylline			
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)		
Method	Enzyme immunoassay (EIA)		
TAT	1 day, STAT		
Clinical Usage	Monitoring of Theophylline dosage		
Reference Range	Adult Asthmatic	44 – 111 µmol/L	

Thyroxine, Free (Free T4)			
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)		
Method	2-step immunoassay using CMIA technology		
Performed	Daily		
TAT	1 day		
Clinical Usage	Diagnose hyperthyroidism and hypothyroidism		
Reference Range	Adults :	9.01 - 19.05 pmol/L	

Thyroid Stimulating Hormone (TSH), 3rd Gen.			
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)		
Method	2-step Immunoassay using CMIA technology		
Performed	Daily		
TAT	1 day		
Clinical Usage	Diagnose hyperthyroidism and hypothyroidism		
Reference Range	Adult		0.35 – 4.94 mIU/L
	Children	Newborns	0.70 – 15.2 mIU/L
		6 d – 3 mths	0.72 – 11.0 mIU/L
		4 – 12 mths	0.73 – 8.35 mIU/L
		1 – 6 yr	0.70 – 5.97 mIU/L
		7 – 11 yr	0.60 – 4.84 mIU/L

TSH Cord Blood (Neonate)

Specimen	Blood (green top only- 4mL)
Method	Electrochemiluminescence Immunoassay
Performed	Daily
TAT	1 day
Clinical Usage	Screen for neonatal hypothyroidism
Reference Range	2.5 – 25mIU/L

Free T4 Cord Blood (Neonate)

Specimen	Blood (green top only- 4mL)
Method	Electrochemiluminescence Immunoassay
Performed	Daily
TAT	1 day
Clinical Usage	Diagnose hyperthyroidism and hypothyroidism
Reference Range	12.5 – 27.5 pmol/L

Triiodothyronine, Free (Free T3)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step Immunoassay using CMIA technology
Performed	Daily
TAT	1 day
Clinical Usage	Diagnosis of hyperthyroidism
Reference Range	Adults 2.43 – 6.01 pmol/L

Transferrin

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Unacceptable	Haemolysed
Method	Immunoturbidimetric
Performed	Daily
TAT	1 day
Clinical Usage	Differential diagnosis of microcytic anaemia
Reference Range	Adults, Male 1.74 – 3.64 g/L Female 1.80 – 3.82 g/L

Triglyceride, Fasting

Specimen	Blood (SSTII gold top - 5ml) Fasting specimen (10-12 hrs) required
Unacceptable	Fasting less than 10 – 12 hrs
Method	Enzymatic (Glycerol Phosphate Oxidase)
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of lipid status
Reference Range	Desirable : 0 – 1.69 mmol/L

STAT High Sensitive Troponin-I

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	2-step Immunoassay using CMIA technology
TAT	Routine 1 day, STAT 2 hour
Clinical Usage	Marker of myocardial injury
Reference Range	Male : 21 - 73 Y: < 34.2 ng/L Female : 21 - 75 Y: < 15.6 ng/L

Urea, Serum

Specimen	Blood (SSTII gold top - 5ml)
Method	Enzymatic rate /Urease
TAT	Routine 1day, STAT 2hr
Clinical Usage	Assessment of fluid balance and renal function
Reference Range	Adults : Male < 50 yrs old 3.2 – 7.4 mmol/L > 50 yrs old 3.0 – 9.2 mmol/L Female < 50 yrs old 2.5 – 6.7 mmol/L > 50 yrs old 3.5 – 7.2 mmol/L

Urea, Urine

Specimen	Random urine: 20mL in sterile screw-capped container, no preservative or 24 hr urine collection, no preservative
Method	Enzymatic rate (Urease)
Performed	Daily
TAT	1 day
Clinical Usage	Assessment of fluid balance and renal function
Reference Range	Random: NA 24hr: 428 – 714 mmol/day

Uric Acid (UA)

Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)
Unacceptable	Lipaemic
Method	Enzymatic (uricase)
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of uric acid metabolism
Reference Range	Adults, Male 220-450 µmol/L Female 150-370 µmol/L

Uric Acid (UA), 24 hr urine	
Specimen	24 hr urine collection, preservative:10mL 5% NaOH
Method	Enzymatic
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of uric acid metabolism
Reference Range	Average diet, 1.480 – 4.430 mmol/day

Valproic Acid (Valproate)	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)
TAT	1 day,STAT
Clinical Usage	Monitoring of Valproate dosage
Reference Range	Therapeutic range: 346.5 – 693 µmol/L

Vancomycin Level, Peak	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Collect 30 min after end of IV infusion, or 60 min after IM injection
Unacceptable	Haemolysed, more than 24 hours old
Method	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)
TAT	1 day,STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	Adults, Therapeutic 20 – 40 µg/L

Vancomycin Level, Trough	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml). Collect specimen immediately before next dose
Unacceptable	Haemolysed, more than 24 hours old
Method	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)
TAT	1 day,STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	Adults, Therapeutic 5 – 10 µg/L

Vitamin B12	
Specimen	Blood (SSTII gold top - 5ml or red top- 6ml).
Transport	Send to the Lab immediately
Unacceptable	Haemolysed
Method	2-step Immunoassay using CMIA technology
Performed	Monday and Thursday
TAT	1 week
Clinical Usage	Assessment of Vitamin B12 deficiency
Reference Range	138 - 652 pmol/L